A STUDY ON PATTERN OF ANTIDIABETIC DRUGS USED IN TYPE 2 DIABETES PATIENTS IN A TERTIARY CARE TEACHING HOSPITAL

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Abstract:

Background: *Diabetes mellitus is a metabolic disease characterized by elevated blood sugar levels due to insulin resistance and relative insulin deficiency.To encourage sensible medication use in diabetes and provide useful information for the medical team, research on the patterns of anti-diabetic drug usage is crucial. The goal of this brief study is to provide an overview of the current pharmacologic management strategies for decreasing increased blood glucose in type 2 diabetes, covering the range of drugs now in use.*

Methods:*This was a prospective study of patients with Diabetes mellitus in the medicine ward at the Government Cuddalore Medical College and Hospital (GCMCH).*

Results: *This study comprised a total of 200 participants with diabetes. Males made up 52% of the population while females made up 48%. Diabetes was more common in those between the ages of 46 and 55. The most common comorbidity was hypertension that is 40% linked to diabetes. Of the prescriptions, 93% were for oral antidiabetic medications, 5% were for insulin + oral medications, and 2% were for insulin. In contrast to monotherapy(37.5%) or three combination medications (13%) , dual combination therapy (42.5%) was more common than both therapies. The two most commonly prescribed oral antidiabetic drugs were metformin (46.5%) and glimepride (17%). Most frequently insulin was given as Inj Human Actrapid (4.5%).The poll found that the majority of patients correctly adhered to the medical compliance guidelines.*

Conclusion: *Metformin (biguanide) was the most often used antidiabetic medication for type 2 diabetes. The study found that antidiabetic prescriptions were substantially consistent with NICE guidelines.Through gaining a comprehensive awareness of current prescribing practices, efforts can be taken to enhance the effectiveness and quality of medication therapy.*

Keyword: *Diabetes Mellitus, Oral antidiabetic drugs, Insulin, Glycemic control, Drug utilization, Prescribing pattern.*

1.Introduction:

Diabetes Mellitus (DM) is a metabolic illness characterized by hyperglycaemia and improper carbohydrate and lipid metabolism which can lead to chronic consequences such as microvascular and macrovascular problems. There are various types of diabetes, including type 1, type 2, maturity onset diabetes of the young (MODY), gestational diabetes, neonatal diabetes, and secondary causes such as endocrinopathies and steroid use. Type 1 diabetes mellitus (T1DM) and Type 2 diabetes mellitus (T2DM) are the two most common subtypes of DM, which are caused by little or no pancreatic production of insulin due to autoimmune reaction(T1DM), and impaired insulin secretion or insulin resistance (T2DM) .T1DM often affects children and adolescents, but T2DM is likely to affect middle-aged and older individuals who have chronic hyperglycaemia due to poor lifestyle and nutritional choices.[1]

The International Diabetes Federation (IDF) recently released a statement stating that 537 million persons worldwide suffer from Diabetes Mellitus , making it a significant global burden. By 2025, it is projected that 80 million people in India would have diabetes, making the country the "Diabetes Capital of the World".[2]

Severe diabetes consequences, including retinopathy, neuropathy, nephropathy, cardiovascular problems, and ulceration, arise from tissue or vascular damage that occurs as the illness advances.

Hypoglycaemia control cannot be achieved by only life style modification, along with pharmacological treatment is also necessary to control blood sugar level. Both oral hypoglycemic medications and insulin are used either alone or in combination therapy. Patients with type 1 DM are treated primarily with insulin replacement therapy whereas type 2 DM patients are treated and managed mostly with diet , lifestyle changes and anti- diabetic drugs.[3] The main classes of oral antidiabetic drugs includes sulphonylureas-Enhance insulin secretion(Glibenclamide, Glipizide, Gliclazide, Glimepiride),Biguanides-acts directly or indirectly on the liver to lower glucose production(Metformin),Meglitinide / Phenylalanine analogues-stimulate insulin secretion(Repaglinide, Nateglinide),Dipeptidyl peptidase - 4 inhibitors-enhances insulin secretion and reduces glucagon secretion(Sitagliptin, Vildagliptin, Saxagliptin, Teneligliptin),Thiazolidinedione-lower insulin resistance by acting as agonists for the peroxisome proliferator-activated receptor-y (PPARY)(Pioglitazone, Rosiglitazone) ,α - Glucosidase inhibitors-delay digestion and absorption of intestinal carbohydrates-Acarbose(Miglitol, Voglibose),Sodium-glucose co-transport-2 (SGLT-2)-decrease reabsorption of glucose, increase urinary glucose excretion, and lower blood glucose(Dapagliflozin, Canagliflozin) . [4,5]

Prescription patterns characterize the type and character of prescription use and adherence to local, state, or federal requirements, such as standardized prescribing procedures, the use of pharmaceuticals on the essential drug list, and the use of generic medications. The aim of Prescription Pattern Monitoring Studies(PPMS) is to facilitate the rational use of drugs in a population. A part of medical audit, which looks for monitoring, assessment, and required

changes in prescribing procedures to achieve logical and economical pharmacotherapy, involves the analysis of drug usage or prescribing trends. One of the effects of illogical prescribing is medication non-adherence, which raises drug and medical expenses and may lead to difficulties from uncontrolled blood glucose levels. Prescription pattern analysis of antidiabetic drugs supports rational drug use and prevents poor glycemic control.[5, 6]

This study aims to give a general review of the pharmacologic management strategies now employed to lower increased blood glucose levels in type 2 diabetes, including the medications currently in use.

2.Methodology:

This was a prospective study conducted from September 1, 2023 to February 29, 2024 in the Department of Medicine, Government Cuddalore Medical College and Hospital (GCMCH), Tamilnadu, India. This study was conducted after obtaining the approval from Institutional Review Board and Ethics Committee. The primary objective of the study is to analyse the prescription pattern of oral antidiabetic drugs used for type 2 diabetes patients in the tertiary care hospital during the given period of time. A total of 200 patients were included in the study based on inclusion and exclusion criteria.**Inclusion criteria**:Type 2 diabetic patients of both sexes with age group above 18 years were included in the study**. Exclusion criteria**:Patients with Type 1 diabetes,gestational diabetes and neonatal diabetes were excluded.

3.Observation and Results:

A total of 200 patients with T2DM were included in the study , among which males were 104 (52%) and females were 96 (48%).

The age group distribution states that the maximum subjects were between the age group 46- 55 years and minimum number of subjects were found between the age group of 26-35 years.

Table 1: Age and Gender-wise distribution of study participants

AGE	Frequency (N)	Percentage (%)	Gender distribution	
			Males N (%)	Females N (%)
26-35	18	9	12 (6)	6 (3)
36-45	31	15.5	9 (4.5)	22 (11)
46-55	66	33	39 (19.5)	27 (13.5)
56-65	49	24.5	21 (10.5)	28 (14)
66-75	36	18	23 (11.5)	13 (6.5)
Total	200	100	104 (52)	96 (48)

Table 2: Types of comorbidity in Diabetic patients

Comorbidity	Number of Patients (N=200)	Percentage(%)
Diabetic ketoacidosis	5	2.5%
Hypertension	80	40%
Neuropathy	40	20%
Retinopathy	30	15%
Peripheral vascular disease	30	15%
Nephropathy	10	5%
COPD	5	2.5%

About 40% of individuals have hypertension, the most prevalent comorbidity and consequence. Peripheral vascular disease (15%), peripheral neuropathy (20%), and retinopathy (15%) were the most common diabetes sequelae in the Indian population.Diabetic ketoacidosis and COPD was shown to be the least prevalent diabetes consequence, occurring in 5% of cases.

Description of Drug present in each prescription :

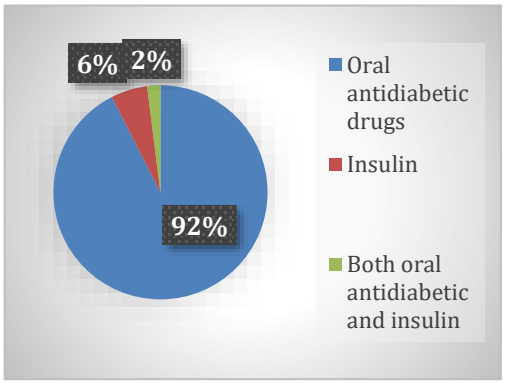

Fig 1: Indicates the mode of treatment

OHA was used to treat around 93% (n = 186) of patients with diabetes, while 5% (n = 10) received both OHA and insulin, and 2% (n = 4) received insulin.

In our study , the majority of the patients had a previous family history of diabetes . Of these 200 patients,154(77%) have a family history , while 46(33%) do not.

Table 3: prescription pattern of antidiabetic drugs (N=186)

Drug class	Drugs	N (%)
Single Drug therapy		
Biguanides	Metformin	75(37.5)
Dual drug combination		
Sulfonyl ureas + Biguanides	Glimepride + Metformin	52(26)

	Glipizide + Metformin	3(1.5)
	Glibenclamide + Metformin	5(2.5)
	Gliclazide + Metformin	10(5)
Biguanides + Thiazolidinedione	Metformin + Pioglitazone	3(1.5)
Biguanides+Dipeptidyl peptidase 4 inhibitors (DPP-4)	Metformin + Sitagliptin	4(2)
	Metformin + Vildagliptin	2(1)
	Metformin + Tenegliptin	1(0.5)
Thiazolidinedione+Sulfonylurea	Pioglitazone + Sulfonylureas	3(1.5)
Biguanides + Meglitinides	Metformin + Repaglinide	2(1)
Trible drug combination		
Sulfonylureas + Biguanides + thiazolidinedione	Glimepride+Metformin+ Pioglitazone	10(5)
Sulfonylureas+Biguanides+ DPP-4 inhibitors	Glimepride+Metformin+Tenegliptin	4(2)
	Glibenclamide+Metformin+vildagliptn	3(1.5)
Sulfonylureas+Biguanides+a-glucosidase inhibitors	Glimepride+Metformin+Voglibose	8(4)
Biguanides+DPP-4 Inhibitors+Sodium-glucose cotransporter (SGLT2) inhibitors	Metformin+Tenegliptin+Dapagliflozin	1(0.5)

Out Of 186 patients who were administered oral hypoglycemic medications , 37.5%(n=75) received single-drug therapy whereas 55.5% (n=111) received combination therapies. In combination therapies of OHA drugs, 42.5% (n=85) of patients had a combination of dual medications whereas 13% (n=26) received a combination of triple drugs.From the data,most frequently prescribed medications were Metformin alone used as monotherapy (37.5%) followed by Glimepride + metformin (26%) as dual combination therapy and Glimepride+metformin+pioglitazone(5%) as triple combination therapy.

Table 4: Overall utilization of Antidiabetic drugs (N=200)

Class of drug	Name of the Drug	Frequency (N)	Percentage(%)
Sulfonylureas	Glimepride	34	17
	Glipizide	3	1.5
	Glibenclamide	8	4
	Gliclazide	5	2.5
Biguanides	Metformin	93	46.5
Meglitinides	Repaglinide	1	0.5
DPP-4 Inhibitors	Sitagliptin	4	2
	Teneligliptin	7	3.5
	Vildagliptin	5	2.5
a-Glucosidase Inhibitors	Voglibose	12	6
SGLT-2 Inhibitors	Dapagliflozin	2	1
Thiazolidinediones	Pioglitazone	11	5.5
Insulin preparations	H.Actrapid	9	4.5
	Insulin basalog	3	1.5
	Insulin Mixtard	1	0.5
	Biphasic Insulin	2	1

The overall utilization of oral hypoglycaemic agents stated as Metformin was the most commonly prescribed drug in patients with Type 2 Diabetes Mellitus 93(46.5%). Other commonly prescribed drugs are Glimepride 34(17%) and Voglibose 12(6%). Human Actrapid (4.5%) was the drug of choice for Insulin preparation among the study participants.

4.Discussion:

Diabetes mellitus is a significant public health issue worldwide. It's incidence is increasing in emerging countries, including India. It is expected to become the diabetes capital of the globe in the near future. Individuals with Type 2 Diabetes are prioritized for prompt evaluation to avert complications.The present study was a hospital based cross sectional study conducted in the tertiary care hospital focusing on drug utilization pattern among Type II diabetic patients. The primary objective of the study is to assess the antidiabetic drug prescription pattern among diabetic patients attending the medicine department.

Profile of patients with Type 2 diabetes mellitus:

Among 200 patients with Type 2 diabetes, 104 (52%) were men and 96 (48%) were women, indicating that men were predominated over women similar to other study conducted in India by Abdi S A, Churi S *et al.* [7] The majority of them were in the age bracket of 46-55 (33%)years, while the minimum age group was between 26-35 (9%)years, according to Tiwari K, Bisht M *et al.* [8]

The findings revealed that Hypertension (40%) was the most common comorbidity associated with diabetes followed by neuropathy (20%), peripheral vascular disease (15%) ,retinopathy(15%), nephropathy (5%), diabetic ketoacidosis (2.5%)and chronic obstructive pulmonary disease (2.5%),similar to studies reported by Iglay *et al* .[9]

According to the study, the majority of diabetic patients (93%) were taking oral hypoglycemic agents, followed by 5% (n=10) taking both insulin and oral hypoglycemic agents (OHA), and 2% (n=4) taking insulin alone as stated by Saibal AA *et al.* [10]

About 154 patients (77%) had a family history of diabetes and 46 patients (33%) had no family history of diabetes in the study related to Agarwal AA, Jadhav PR *et al.*[11]

Out of 186 patients prescribed with oral hypoglycaemic agents, about 37.5% (n=75)were prescribed monotherapy and about 55.5% (n=111) were prescribed combination therapy. Of combination therapy, 42.5% of patients (n=85) were prescribed two drugs combination therapy and 13% (n=26)were prescribed with three drug combination therapy as similar to Kombathula SA *et al.* [12]

Prescription pattern:

This study focused on the prescription pattern among diabetic patients attending the medicine department in the hospital. The principal aim of prescription pattern study is to facilitate the rational use of drugs in populations. For the individual patient, the rational use of a drug implies the prescription of a well-documented drug at an optimal dose, together with the correct information, at an affordable price. Knowledge of how drugs are being prescribed and used will help to identify issues in addressing rational drug use or suggest measures to improve prescribing habits. With this point of view the study was designed.

In our study, metformin 37.5%(n= 75) was the most commonly prescribed monotherapy drug whereas metformin+ glimepride 26% (n= 52)we're the often prescribed dual combination drugs and metformin +glimepride+pioglitazone 5%(n=10) were the most prescribed triple combination drugs as reported by Dhas Ak and Kombathula SA*et al.*[5, 12]

The overview in utilization of anti-diabetic drugs based on drug category stated that metformin (Biguanides) 46.5% (n=93) was the most prescribed OHA drug for type 2 diabetes followed by Glimepride (sulphonylureas)17% (n=34), Voglibose (alpha-glucosidase inhibitors) 6% (n=12), Pioglitazone (Thiazolidinedione) 5.5% (n=11), SGLT-2-inhibitors (Dapagliflozin) 1% (n=2),Repaglinide(meglitinides) 0.5% (n=1) and Insulin(H.Actrapid) 4.5% (n=9) , a similar result reported in a survey by Patel B, Acharya KG *et al.* [13,14]

Consequently, metformin is a commonly prescribed first-line medication for the management of Type 2 diabetes, both alone and in combination with other medications. Hypoglycaemia can make Type 2 diabetes more difficult and severely impede the goal of glycaemic control. Metformin rarely causes substantial hypoglycaemia when administered as monotherapy

because it reduces excess hepatic gluconeogenesis without increasing insulin levels. Metformin is also reasonably priced, which enables patients with limited incomes to purchase treatment. The current study primarily prescribes the short-acting type of injection, H. Actrapid, because it helps prevent major problems related to diabetes, such as blindness and kidney damage.

This study demonstrated that the trend in antidiabetic prescription has shifted from monotherapy to combination and insulin therapies with a focus on using biguanides and short-acting insulin to improve glycaemic control.

5.Conclusion:

Metformin was the predominantly prescribed Oral Hypoglycaemic Agent followed by Glimepiride.

Biguanides were the most often used medication class of antidiabetic drugs .Regarding combination therapy,Metformin was the most commonly prescribed drug where it is combined with all types of OHA and Insulin.Overall combination therapy was found to be more prevalent than monotherapy.Thus,it can be concluded that the rational drug prescription is high and the drug use is quite sensible.

The study also found that patient education/counselling is required because many of them do not maintain a healthy weight engage in physical activity, or adhere to treatment regimens. This can be improved with adequate patient counselling.

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